

WHAT IS CLAIMED IS:

1. A method comprising:
 - providing a link memory to store linked pointers for controlling access to a packet memory; and
 - 5 maintaining at least two free link lists in the link memory, each free link list indicating a respective linked set of free storage locations in the packet memory.
2. The method of claim 1, wherein each of the free link lists is permitted to point to any storage location in the packet memory, except that no link in any of the free link lists points to a free link in another free link list.
- 10 3. The method of claim 1, wherein each of the free link lists includes a plurality of pointers, each pointer indicating a corresponding storage location in the packet memory and a corresponding storage location in the link memory.
4. The method of claim 1, further comprising:
 - in each clock cycle in which a memory allocation request is serviced, allocating
 - 15 storage locations from the packet memory that are pointed to by a one of the free link lists that is, at the time of said each clock cycle, at least as large as any other of the free link lists.
5. The method of claim 1, further comprising:
 - in each clock cycle in which storage locations in the packet memory are freed,
 - 20 assigning a freed linked set of pointers in the link memory to a one of the free link lists that is, at the time of said each clock cycle, at least as small as any other of the free link lists.

6. The method of claim 1, wherein more than two free link lists are maintained in the link memory.

7. An apparatus comprising:

a link memory to store linked pointers for controlling access to a packet memory;

5 and

a memory controller coupled to the link memory and operative to:

maintain at least two free link lists in the link memory, each free link list indicating a respective linked set of free storage locations in the packet memory.

8. The apparatus of claim 7, wherein each of the free link lists is permitted to point to
10 any storage location in the packet memory, except that no link in any of the free link lists points to a free link in another free link list.

9. The apparatus of claim 7, wherein each of the free link lists includes a plurality of pointers, each pointer indicating a corresponding storage location in the packet memory and a corresponding storage location in the link memory.

15 10. The apparatus of claim 7, wherein, in each clock cycle in which the memory controller services a memory allocation request, the memory controller allocates storage locations from the packet memory that are pointed to by a one of the free link lists that is, at the time of said each clock cycle, at least as large as any other of the free link lists.

11. The apparatus of claim 7, wherein, in each clock cycle in which the memory controller frees storage locations in the packet memory, the memory controller assigns a freed linked set of pointers in the link memory to a one of the free link lists that is, at the time of said each clock cycle, at least as small as any other of the free link lists.
- 5 12. The apparatus of claim 7, wherein the link memory is a dual port memory.
13. The apparatus of claim 7, wherein more than two free link lists are maintained in the link memory.
14. A system comprising:
- a packet memory to store packet data;
 - 10 a link memory to store linked pointers for controlling access to the packet memory; and
 - a memory controller coupled to the link memory and operative to:
 - maintain at least two free link lists in the link memory, each free link list indicating a respective linked set of free storage locations in the packet memory.
- 15 15. The system of claim 14, wherein each of the free link lists is permitted to point to any storage location in the packet memory, except that no link in any of the free link lists points to a free link in another free link list.
16. The system of claim 14, wherein each of the free link lists includes a plurality of pointers, each pointer indicating a corresponding storage location in the packet memory
- 20 and a corresponding storage location in the link memory.

17. The system of claim 14, wherein, in each clock cycle in which the memory controller services a memory allocation request, the memory controller allocates storage locations from the packet memory that are pointed to by a one of the free link lists that is, at the time of said each clock cycle, at least as large as any other of the free link lists.
- 5 18. The system of claim 14, wherein, in each clock cycle in which the memory controller frees storage locations in the packet memory, the memory controller assigns a freed linked set of pointers in the link memory to a one of the free link lists that is, at the time of said each clock cycle, at least as small as any other of the free link lists.
19. The system of claim 14, wherein the link memory is a dual port memory.
- 10 20. The system of claim 14, wherein more than two free link lists are maintained in the link memory.
21. An apparatus comprising:
a storage medium having stored thereon instructions that when executed by a machine result in the following:
- 15 maintaining at least two free link lists in a link memory, each free link list indicating a respective linked set of free storage locations in a packet memory.
22. The apparatus of claim 21, wherein each of the free link lists is permitted to point to any storage location in the packet memory, except that no link in any of the free link lists points to a free link in another free link list.

23. The apparatus of claim 21, wherein each of the free link lists includes a plurality of pointers, each pointer indicating a corresponding storage location in the packet memory and a corresponding storage location in the link memory.

24. The apparatus of claim 21, wherein the storage medium has stored thereon
5 instructions that when executed by a machine further result in the following:

in each clock cycle in which a memory allocation request is serviced, allocating storage locations from the packet memory that are pointed to by a one of the free link lists that is, at the time of said each clock cycle, at least as large as any other of the free link lists.

10 25. The apparatus of claim 21, wherein the storage medium has stored thereon instructions that when executed by a machine further result in the following:

in each clock cycle in which storage locations in the packet memory are freed, assigning a freed linked set of pointers in the link memory to a one of the free link lists that is, at the time of said each clock cycle, at least as small as any other of the free link
15 lists.

26. The apparatus of claim 21, wherein the storage medium has stored thereon instructions that when executed by a machine further result in the following:

more than two free link lists are maintained in the link memory.